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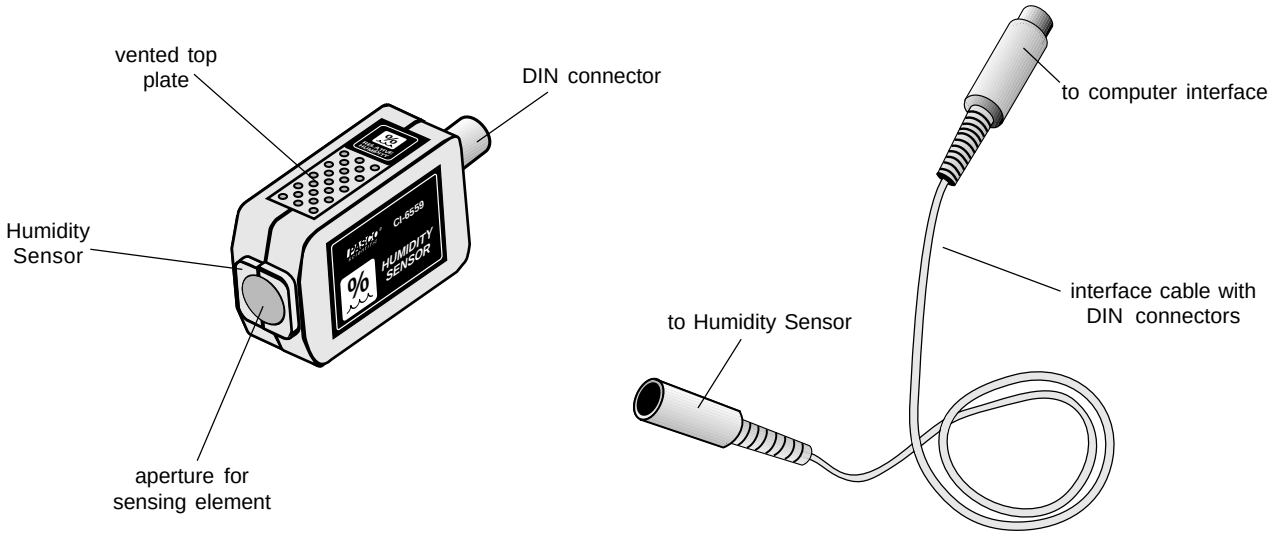
Instruction Sheet for the PASCO Model CI-6559

HUMIDITY SENSOR



Introduction

The PASCO CI-6559 Humidity Sensor is designed to be used with the PASCO ScienceWorkshop® computer interface and DataStudio™ or ScienceWorkshop® software. The Humidity Sensor may be used for making single readings or continuous monitoring of relative humidity (RH).

Equipment Included:

- CI-6559 Humidity Sensor
- 6-foot cable with 8-pin DIN connectors
- instruction sheet
- storage bag

Additional Equipment Required:

- Any PASCO *ScienceWorkshop*® computer interface.
- PASCO DataStudio™ software

  Or

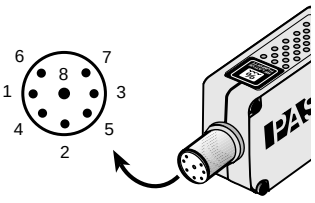
  PASCO *ScienceWorkshop*® software, version 2.2.5 or higher.

Specifications

Range:	0% - 100% RH
Accuracy:	
-no calibration	± 5% RH at 60% RH ± 8% at 90% RH
-with saturated salt calibration	± 2% 0% - 100% @25 °C
Resolution:	0.1% RH
Response Rate:	15 seconds in slow moving air
Repeatability:	± 0.5% RH
Connector Type:	8-pin DIN, *ScienceWorkshop* interface compatible
Voltage Output:	0 - 10V (0% - 100% RH)

DIN Connector

1: analog output (+), 0-10 V
2: analog output (-), signal ground
3: no connection
4: +5 VDC power
5: power ground
6: +12 VDC power
7: -12 VDC power
8: no-connection



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Theory

The Humidity Sensor consists of two basic elements: the humidity sensing element and the signal condition amplifier.

The humidity sensing element is powered by +5 volts DC and outputs a DC voltage that is proportional to the relative humidity of the air surrounding the sensing element. The element is an integrated circuit, which features high reliability and fast response, and is contamination resistant. The output voltage of the sensing element varies between 0.8 and 3.9 VDC, which corresponds to a relative humidity ranging from 0 to 100%, respectively.

Two stages of amplification are provided to condition the signal from the humidity sensing element for input to the *ScienceWorkshop* computer interface. The output of these two stages will range from 0 to 10 VDC, which will correspond to 0 to 100% humidity.

The first stage is used to reference the sensor output range from 0 to 3.1 volts. This establishes 0 volts as the 0% relative humidity point. The second stage applies a gain of about 3.2, which causes the maximum sensor output, 3.1VDC, to increase to 10VDC, which corresponds to a 100% relative humidity. Both DataStudio and *ScienceWorkshop* software take the 0 - 10V output from the sensor, multiply it by 10 and display the result as relative humidity.

The Humidity Sensor can be plugged directly into any *ScienceWorkshop* computer interface or connected to the interface box using the supplied cable with 8-pin DIN connectors.

Setup Procedure

1. Connect the Humidity Sensor and any analog channel into the PASCO Computer Interface with interface cable (Figure 1A),

   or

   Insert the DIN plug of the Humidity Sensor directly into any analog channel on the PASCO Computer Interface (Figure 1B).

2. Open the Experiment Setup window in DataStudio or *ScienceWorkshop*. Click and drag the analog plug icon to the analog channel icon that matches the analog port you are using for the Humidity Sensor.

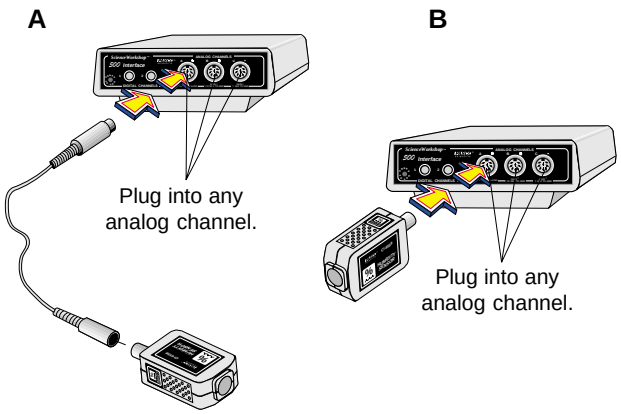

Figure 1. Connecting the Humidity Sensor into the computer interface.

3. Select "Humidity Sensor" from the Sensors list (DataStudio™) or drop-down menu (*ScienceWorkshop*®).

4. Open a display window, such as the graph display. In DataStudio, doubleclick the graph icon in the display list. In *ScienceWorkshop*, drag and drop the graph icon over the Humidity Sensor icon.

5. Additional display windows can be opened by following the procedure in step 4.

Operational Notes

To prevent damage to the Humidity Sensor or other equipment, do not immerse the Humidity Sensor in fluid.

The sensing element resists contamination vapors, such as organic solvents, chlorine, and ammonia. The element is also unaffected by water condensation.

➤ **For best results:** The Humidity Sensor is capable of responding fairly quickly to changes in the humidity. However, in order to respond, a sample of the environment (air) must reach the sensing element (positioned near the sensor aperture). The sensor responds quickest when it is in a slow moving air stream. This may be accomplished by moving the sensor slowly with your hand during data collection.

➤ **To avoid errors:** The sensing element can be affected by the bright light of the sun. Do not point the aperture for the sensing element directly toward the sun or a bright light.

Calibration of the Humidity Sensor

For most applications, calibration of the Humidity Sensor is not required.

If the sensor is to be calibrated with DataStudio or *ScienceWorkshop*, one of two methods may be used: 1) "single point" calibration method or 2) "two point" calibration method. (Each method is described, in detail, in the DataStudio online help manual and the *ScienceWorkshop* software user manual.)

Use of either method requires that the sensor be exposed to a sample of known relative humidity.

Single Point Calibration

The "single point" calibration method is fairly easy to implement. The "single point" calibration is a "two point" calibration (see below) where the output of the Humidity Sensor is assumed to be 0 volts at 0% RH.

To open the Calibration window, double-click on the Humidity Sensor icon in the Experiment Setup window. The other point for calibration is gained by exposing the Humidity Sensor to an atmosphere of known relative humidity. When the humidity reading is relatively constant, enter the known % RH value in the High Value area in the Calibration window and click "Take Reading" (DataStudio) or "Read" (*ScienceWorkshop*). Click OK to close the Calibration window.

Two Point Calibration

The "two point" calibration is more difficult because the sensor must be exposed to two distinctively different atmospheres of different levels of known relative humidities to read high and low values for calibration. This difficulty may be overcome by using a device known as a saturated salt cell.

A saturated salt cell is an enclosed system containing a saturated salt solution and air. The air in the closed system will come to equilibrium at a particular relative humidity. The specific RH at which the system comes to equilibrium is based on the ability of the saturated salt solution to extract or add (through evaporation) water vapor from or to the air. This is a common tool for calibration of relative humidity instruments.

The high and low % RH readings should be entered in the Calibration window, as explained in the "Single Point Calibration" section.

Constructing a Saturated Salt Cell

1. A one-liter glass or plastic-covered container may be used as a vessel for a cell.
2. Place distilled or deionized water approximately one centimeter deep into the vessel.
3. Add enough "salt" to create the desired saturated solution.

➤ **Hint:** Excess "salt" should be present (visible as it settles to the bottom of the vessel) to ensure saturation of the solution.

A closed cell constructed with NaCl as the excess "salt" will have a RH of about 75%. A similar constructed cell using MgCl will have a RH of about 33%.

The "single point" calibration method may also be accomplished with a saturated salt cell.

When performing the calibration, the Humidity Sensor should be placed in the saturated salt cell and allowed to equilibrate. This could take as long as 30 minutes or more.

Mounting on an Experimental Apparatus

Use the 1/4-20 screw connector located on the bottom of the sensor box to secure the Humidity Sensor to an experimental apparatus (Figure 2). The alignment hole fits over an alignment pin included on some PASCO apparatuses.

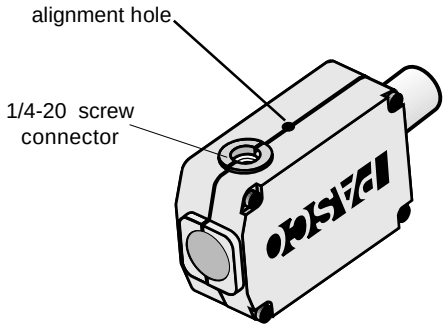

Figure 2. Mounting connector and alignment hole.

Copyright, Warranty, and Equipment Return

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Limited Warranty

PASCO scientific warrants the product to be free from defects in materials and workmanship for a period of one year from the date of shipment to the customer. PASCO will repair or replace, at its option, any part of the product which is deemed to be defective in material or workmanship. The warranty does not cover damage to the product caused by abuse or improper use. Determination of whether a product failure is the result of a manufacturing defect or improper use by the customer shall be made solely by PASCO scientific. Responsibility for the return of equipment for warranty repair belongs to the customer. Equipment must be properly packed to prevent damage and shipped postage or freight prepaid. (Damage caused by improper packing of the equipment for return shipment will not be covered by the warranty.) Shipping costs for returning the equipment after repair will be paid by PASCO scientific.

Equipment Return

Should the product have to be returned to PASCO scientific for any reason, notify PASCO scientific by letter, phone, or fax BEFORE returning the product. Upon notification, the return authorization and shipping instructions will be promptly issued.

➤ **NOTE:** NO EQUIPMENT WILL BE ACCEPTED FOR RETURN WITHOUT AN AUTHORIZATION FROM PASCO.

When returning equipment for repair, the units must be packed properly. Carriers will not accept responsibility for damage caused by improper packing. To be certain the unit will not be damaged in shipment, observe the following rules:

① The packing carton must be strong enough for the item shipped.

② Make certain there are at least two inches of packing material between any point on the apparatus and the inside walls of the carton.

③ Make certain that the packing material can not shift in the box, or become compressed, allowing the instrument to come in contact with the edge of the packing carton.

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